



Review Article

Perspective on morbidity and mortality of cervical surgery performed in outpatient/same day/ambulatory surgicenters versus inpatient facilities

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Received : 22 May 2021

Accepted : 03 June 2021

Published : 12 July 2021

DOI

10.25259/SNI_509_2021

Quick Response Code:



ABSTRACT

Background: This is an updated analysis of the morbidity and mortality of cervical surgery performed in outpatient/same day (OSD) (Postoperative care unit [PACU] observation 4–6 h), and ambulatory surgicenters (ASC: PACU 23 h) versus inpatient facilities (IF).

Methods: We analyzed 19 predominantly level III (retrospective) and IV (case series) studies regarding the morbidity/mortality of cervical surgery performed in OSC/ASC versus IF.

Results: A “selection bias” clearly favored operating on younger/healthier patients to undergo cervical surgery in OSD/ASC centers resulting in better outcomes. Alternatively, those selected for cervical procedures to be performed in IF classically demonstrated multiple major comorbidities (i.e. advanced age, diabetes, high body mass index, severe myelopathy, smoking, 3–4 level disease, and other comorbidities) and had poorer outcomes. Further, within the typical 4–6 h. PACU “observation window,” OSD facilities “picked up” most major postoperative complications, and typically showed 0% mortality rates. Nevertheless, the author’s review of 2 wrongful death suits (i.e. prior to 2018) arising from OSD ACDF cervical surgery demonstrated that there are probably many more mortalities occurring following discharges from OSD where cervical operations are being performed that are going underreported/unreported.

Conclusion: “Selection bias” favors choosing younger/healthier patients to undergoing cervical surgery in OSD/ASC facilities resulting in better outcomes. Alternatively, choosing older patients with greater comorbidities for IF surgery correlated with poorer results. Although most OSD cervical series report 0% mortality rates, a review of 2 wrongful death suits by just one neurosurgeon prior to 2018 showed there are probably many more mortalities resulting from OSD cervical surgery than have been reported.

Keywords: Ambulatory surgical centers, Cervical disc replacement, Efficacy, Morbidity, Mortality, Multilevel, Outpatient/same day surgery, Safety, Update, anterior cervical discectomy/fusion

INTRODUCTION

In our 2016 review, the results of cervical spine surgery performed in outpatient/same day (OSD) or ambulatory surgicenters (ASC) were compared to those performed in inpatient facilities (IF) [Table 1].^[5] Here, we have updated this comparison, and have further analyzed the pros, cons, morbidity, and mortality of OSD/ASC versus IF cervical surgery.

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Table 1: Update on outpatient cervical surgery.

Author Ref Year	Study design	Data	Data	Data	Outcomes
Fountas <i>et al.</i> ^[6] Spine 2007	Known AE ACDF Under-Reported	1015 ACDF Mortality 0.1% (1 EP)	Morbidity 19.3% (196 patients) Dysphagia 9.5% Hematoma 5.6% Reop 2.4%	RLN 3.1% DT 0.5% EP 0.3% >Myelop 0.2% HS 0.1% SSI 0.1%	AE Dysphagia Hematoma RLN Mortality 0.1%
Garringer <i>et al.</i> ^[7] J Spinal Disord Tech 2010	645 1-Level ACDF 1 Surgeon	4 h Postop OBS	No deaths No Retropharyngeal Hematoma	6% Readmit 80% For Nausea/Pain	48 h AE 2 (0.3%) Epidural Hematomas PredischARGE Mortality 0%
Lied <i>et al.</i> ^[13] Acta Neurol Scan 2013	96 1-2 level ACDF Consecutive ASC Pt	Average age 49.1 60 patients 1 level 36 patients 2 Levels	Discharge 350 min (5 h 50 min) 95 of 96 Home Day 0	91% Satisfied with Surgery NASSQ	Morbidity 5.2% 2 (2.1%) Clot 2 (2.1%) Dysphagia 1 (1.1%) NW
Adamson <i>et al.</i> ^[11] JNS Spine 2016	1000 1-2 ACDF in ASC versus 484 IP 2006-13 Avg. Age ASC 49.5 yo Postop OBS Avg. 4 h	1-Level ASC 629=62.9% 2-level 365 (36.5%)	Readmit 8 (0.8%) to Hospital 3 Pain 2 Chest Pain 1 DT, 2 Clot 2 NW/Reop Mortality 0%	2.2% 30 day Readmit 90 day AE ASC=IPs	1% ASC AE Diagnosed OBS 4 h Concluded: ASC Safe ACDF
Ban <i>et al.</i> ^[3] 2016 Eur J Med Res	Safety ACDF OutPt versus InPt Review Meta-Analysis	12 Articles (English/ Chinese) Mortality 0% OutPt Similar Risk Factors to InPt	Risks AE: ASC=IP Most AE Dysphagia Hematoma	Concluded ASC Safe <Cost	OutPt SS Safe Decreased Cost Beware Postop Dysphagia Hematoma
Epstein <i>et al.</i> ^[5] Surg Neurol Int 2016	ACDF in ASC (13 Articles) Florida; >50% ASC 2000-2007 MD Stake 83%: Own 43%	Excess Surgery in ASC (Idaho) AE in 3279 Cervical surgery from 6 ASC	ASC 99% Same Day Discharge Major AE Occurred Postop in OBS Window 4-23 h <AE/Morbidity 0.8-6% ASC versus 19.3% IP	ASC Now More Complex Cervical Surgery Mortality InPt ACDF 0.1%	Cervical Surgery ASC Puts Patients at Increased Risks Benefits Surgeons MD Owners
Chin <i>et al.</i> ^[4] Clin Spine Surg 2017	OutPt SS/Pvt 2008-2014 1625 Orthop Proc	Criteria: Published SOC (2014 Centers M and M SVC Surg Exp	557 (79%) OutPt 210 (21%) In Pt	197 Fu InPt 72 Dec 138 Fu/TDR	Concluded: 79% Orthop Proc Can Be Done OutPt
Idowu <i>et al.</i> ^[10] Spine 2017	Trend Toward OutPt SS Retrospective Review	Truven Health Marketscan Research Database 2003-2014	Highest Increase ASC LL (1 st level 18.7- 68.5%) Posterior Cervical Decompression-1- Level Disc 0-46.7%	True Ambulatory Procedures Not Increase at Same Rate as OutPt Procedures 23 h OBS	Ambulatory Surgery Not Increasing Same Rate as OutPt Procedures (23=h OBS)
Mohandas <i>et al.</i> ^[15] Spine 2017	OutPt ACDF or CDA SS Use Delphi Panel	Generate Best Practice Guidelines 5 Neurosurg 3 Anes 1 Ortho 1 RN	Review 94 Consensus Statement; 3 Rounds Review: Agree on 83	Consensus 8 Preop Home Care 2 nd Stage Recovery Economics Pt Education	Discharge Same Day Promote Local Protocols

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Table 1: (Continued).

Author Ref Year	Study design	Data	Data	Data	Outcomes
Sivaganesan <i>et al.</i> ^[18] Neurosurgery 2018	Review Clinical Studies Outcomes Ambulatory Cervical Lumbar SS	ACDF PCF CDA LMicroD LL MIS TLIF LLIF	Level 3 Retrospective Level 4 Case Series	Promote Safety Efficacy ASC Surgery	No Level 1 Evidence RCT
Gennari <i>et al.</i> ^[8] Orthop Traumatol Surg Res 2018	OutPt Ambulatory 30 ACDF/CDR Mean OR Time 38 min OBS Postop 10 h 10 min	Mean Age 47.2 Rad 19 C56 11 C67 13 CDR 17 ACDF	1 Transfer New ND 2 Admit Hospital Postop Day 1 Dysphagia	Criteria <65 yo 1 Level ASA <2 Standard Morphology Monitor 6 h (at least)	Ambulatory Success 90% 27/30 10% Failed No Deaths
Mullins <i>et al.</i> ^[16] J Neurosurg Spine 2018	1 Surgeon 1123 ACDF OutPt versus InPt 560 Same Day 563 InPt (1 night)	2003-2016 ACDF SAME DAY ASC versus InPt (1 Night LOS) 40.4% 1 level 34.3% 2 level 21.9% 3 level 3.2% 4 Level	5 Failed Fusion AE 40 Pt (3.6%) 9 Sig AE Sig More Complications 3 and 4-level ACDF	OutPt SAFE for 1-2 Level ACDF Not See MORE AE InPt and OutPt 3-4 level ACDF***	InPt Older, Male More DM More OutPt 1-2 level ACDF AE rate 4.1% OutPt versus 3.0% InPt SAME
Helseth <i>et al.</i> ^[9] Br J Neurosurg 2019	1300 Outpt Cervical SS For C-DSD 2008-2017 6 h Postop OBS	</=90 Days AE Readmit </=1 Year Reop Mortality 0%	16 (1.2%) Major AE 15 Pt 4 ND 2 Clot 1 DT 1 SSI 3 Hoarse 5 Dysphagia	2 Clots < 6 h 2 Readmit (Stroke) 4 Readmit (<90 Days-Surgery Related)	25 (2%) /1171Reop 1 yr Rad: 8 Insuff OR 1 RecD 16 AdjRad Conclude Low AE, Readmit, Reop Rates
Aguilar <i>et al.</i> ^[2] Clin Neurol Neurosurg 2019	Select for OutPt 1 Level ACDF To Avoid Dysphagia	InPt Data Kaiser Permanente Spine Registry 2009-2013 Dysphagia up to 79%	Criteria InPt 747 1 Level ACDF 239 (32%) Dyaphagia With > 48 h LOS High Risk Dysphagia C23/C34 OR	NOT Risk Factors Age, BMI Gender, ASA Smoking OR time	Conclusion >Risk Dysphagia C23/C34 1 level ACDF
Khalid <i>et al.</i> ^[11] World Neurosurgery 2019	InPt versus OutPt Readmission 1-2 level ACDF 28,427 pts 26,368 InPt ACDF 2059 OutPt ACDF	30 day readmit Lower in OutPt versus InPut 4% versus 10.1% InPt More UTI 2.4% versus 1.4%	InPt versus Outpt More DVT 0.6% versus 0% MI 0.2% versus 0% OutPt versus InPt More PE 7.7% versus 0.4%***	OutPt HIGHER Readmit Risk with comorbidities DM Smoking Higher BMI Yemeni	Out Cost 7774.8 versus InPt 7956 Suggest Appropriately Select patients ACDF for OutPt
Khalid <i>et al.</i> ^[12] World Neurosurg 2019	30 Day Readmit/AE OutPt versus InPt	1-2 Level ACDF in Medicare Pt >65 yo	16,386 InPt ACDF 1035 OutPt ACDF >InPt Postop AE	Included: AE: UTI SSI DVT, PE, MI, <Costs, <Readmit (10.1% OutPt versus 4% InPt)	Conclude OutPt ACDF Safe/ Effective <AE <Readmission

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Table 1: (Continued).

Author Ref Year	Study design	Data	Data	Data	Outcomes
Segal <i>et al.</i> ^[17] Spine 2019	1-Level CDA OutPt versus InPt 30 Day Outcomes	NSQUIP 2006-2015 AE Reop Readmit LOS	531 (34.2%) OutPt versus 1022 (65.8%) InPt AE 1.4% versus 0.6% Reop 0.6% versus 0.4% Readmit 0.9% versus 0.8%	No Statistical Differences 30-day Readmit Reop AE InPt versus OutPt 1-level CDA	3-Day AE Rates Low Support 1-level CDA OutPt
McGirt <i>et al.</i> ^[14] Neurosurgery 2020	ACDF OutPt ASC 2000 Consecutive Cases	2000 Pt 1-3 Level ACDF 2006-18 (1 center) PACU OBS 4 h	10 (0.5%) Transfer to InPt Within 4 h OBS Reasons 2 Clots 2 Pain 1 CSF Leak 5 Medical AE No Deaths	Reoperations < 30 Days: 6 (0.3%) All cause Readmission 1.9% Surgical AE ACDF Low rate <1%	AE Diagnose in 4 h Postop OBS Window PACU Concluded; Safe/ Effective Use Selection Criteria
Yemeni <i>et al.</i> ^[19] Neurosurgery 2020	Safety OutPt ACDF Review 21 Articles < 4/2018 AE Reop Stroke DVT/PE Dysphagia Clot Mortality	No Statistically Sig. Difference InPt versus Out Pt Overall AE Stroke DVT/PE Dysphagia, Clot	OutPt ACDF Lower Reop rates, Lower Mortality, and Hospitalization Lack of High level Evidence re: safety of OutPt ACDF	Present Literature Safe with Low AE “Comparable to InPt ACDF in Selected Patients)	Contraindica- tion to OutPt Advanced age Comorbidity Obesity Sig. Myelopathy Not suitable

OutPt: Outpatient, SS: Spine Surgery, Pvt: Private Practice, Proc: Procedures, Orth: Orthopedic, SOC: Standard of Care, M and M: Medicare and Medicaid SVC: Services, Surgeon Exp: Surgeon Experience, Inpt: Inpatient, Dec: Decompression, Fu: Fusion, TDR: Total Disc Replacement, C-DSD: Cervical Degenerative Spinal Disease, Readmit: Readmissions, Reop: Reoperations, Pt: Patient, ND: Neurological Deterioration, Clot: Postop Hematoma, DT: Dural Tear (Cerebrospinal Fluid Leak), SSI: Surgical Site Infection (Deep), Hoarse: Hoarseness, Sx: Symptoms, Rad: Radiculopathy, Insuff: Insufficient Extent First Operations, RecD: Recurrent Disc, AdjRad: Adjacent Level Radiculopathy, Surg: Surgeon, OBS: Observation Period (Postop), h: Hours, yr: Year, yo: Years Old, mos: Months, ACDF: Anterior Cervical Discectomy/Fusion, CLF: Cervical Laminoforaminotomy, CDA: Cervical Disc Arthroplasty, MMicroD: Lumbar Microdiscectomy, LL: Lumbar Laminectomy, MIS TLIF: Minimally Invasive Transforaminal Lumbar Interbody Fusion, LLIF: Lateral Lumbar Interbody Fusion, ASC: Ambulatory Spine Center/Ambulatory SurgiCenter, RCT: Randomized Controlled Trial, Comorbid: Comorbidities, SSI: Surgical Site Infection, COPD: Chronic Obstructive Pulmonary Disease, HTN: Hypertension, SigDiff: Significant Differences, NoDiff: No Differences, CHF: Congestive Heart Disease, Neurosurg: Neurosurgeons, Anes: Anesthesiologist, Ortho: Orthopedist, RN: Registered Nurse, OR: Operating Room, PACU: Postoperative Anesthesia Care Unit, NSQUIP: National Surgical Quality Improvement Program Database, DM: Diabetes, EP: Esophageal Perforation, RLN: Recurrent Laryngeal Nerve Palsy, Myelop: Myelopathy, HS: Horner’s Syndrome, AE: Adverse Events, NW: Neurologically Worse

LOW LEVEL III (RETROSPECTIVE) AND IV (CASE SERIES) EVIDENCE FOR STUDIES COMPARING OSD/ASC VERSUS IF CERVICAL SURGERY

Two studies questioned the safety/efficacy of performing cervical surgery in OSD/ASC versus IF facilities [Table 1].^[18,19] In 2018, Sivaganesan *et al.* determined the quality of such data for cervical and lumbar OSD/ASC surgery were poor, as they were largely based on level III/IV studies, and there were no level I randomized controlled trials.^[18] Further, when Yemeni (2020) *et al.* performed a

meta-analyses of 21 articles (up to April 2018), they also found just low level III/IV evidence that supported the performance of anterior cervical discectomy/fusion (ACDF) in OSD/ASC versus IF.^[19]

GREATER GROWTH FOR ASC (23 h) VERSUS OSD (4-6 h) SPINE SURGERY

Idowu *et al.* (2017) documented, using a large research database, greater growth in the number of ASC-performed lumbar laminectomies and posterior cervical procedures versus those performed in OSD facilities [Table 1].^[10]

MAJOR POSTOPERATIVE ADVERSE EVENTS (AE) FOLLOWING CERVICAL SURGERY “PICKED UP” WITHIN POSTOPERATIVE CARE UNIT (PACU) “OBSERVATION WINDOWS” OF 4–6 h FOR OSD AND UP TO 23 h FOR ASC

Multiple studies documented that major postoperative complications following cervical surgery were “picked up” in PACU “observation windows” that respectively ranged from 4 to 6 h for OSD, and up to 23 h for ASC [Table 1].^[1,4-7,9,13-15] Fountas *et al.* study provided a baseline of 19.3% postoperative AE observed for 1015 inpatients undergoing ACDF.^[6] Complication rates included; 9.5% dysphagia, hematoma 5.6% (2.4% requiring reoperations), recurrent laryngeal nerve palsy 3.1%, dural tear 0.5% and esophageal perforation 0.3%. In three other studies (2010–2016) involving a total of 1741 patients undergoing 1–2 level ACDF, the 4–6 h. postoperative PACU observation window in OSD identified all major postoperative complications occurring in from 0.8 to 5.2 to 6% of cases (i.e. some requiring rehospitalization).^[1,8,13] Gennari *et al.* (2018) found a 10% (3 patients) incidence of AE in a series of just 30 patients undergoing 17 ACDF and 13 cervical disc arthroplasties (CDR) performed in OSD; 1 required immediate postoperative transfer to a hospital for a new neurological deficit requiring emergency surgery, while 2 were admitted to the hospital on postoperative day 1 due to dysphagia that spontaneously resolved.^[8] All 16 (1.2%) major complications (AE) were diagnosed in the 1300 patients in Helseth *et al.* (2019) study for patients undergoing cervical surgery, and observed in the OSD PACU for 6 postoperative h.^[9] These AE included; 4 new neurological deficits, 2 hematomas (both readmitted to the hospital), 1 dural tear, 1 surgical site infection, 3 instances of hoarseness, and 5 cases of dysphagia. Similarly, all 10 (0.5%) major complications were also recognized in McGirt (2020) *et al.* series involving 2000 1–3 level ACDF (2006–2018) observed for 4 h in an OSD PACU; these included 2 hematomas, 2 instances of intractable pain, 1 cerebrospinal fluid leak, and 5 medical complications.^[14]

TWO STUDIES DOCUMENTED COMPARABLE OUTCOMES FOR OSD/ASC VERSUS IF CERVICAL SURGERY

Two studies demonstrated the non-superiority/comparable outcomes for cervical surgery performed in OSD/ASC versus IF [Table 1].^[3,16] The Ban *et al.* (2016) meta-analysis involved 12 articles that demonstrated similar rates of postoperative dysphagia and hematomas occurring following cervical surgery whether performed in OSD/ASC versus IF.^[3] Mullins *et al.* (2018) also found comparable complication rates for 1–2 level ACDF performed in an outpatient setting (OSD 4.1%) versus IF (3.0%).^[16]

RISK FACTORS TO AVOID WHEN SELECTING PATIENTS TO UNDERGO OSD/ASC CERVICAL SURGERY

Multiple studies identified significant risk factors to be avoided when choosing patients for cervical surgery in OSD/ASC vs. IF surgery [Table 1].^[2,16,19] Mullins *et al.* (2018) documented 3 major risk factors, older age, male gender, and diabetes, that correlated with higher complication rates when choosing patients for ACDF surgery in OSD/ASC.^[16] Interestingly, they also found higher complication rates (9 or 3.6%) for patients undergoing 3 or 4 level ACDF performed in either OSD/ASC (560 patients) versus IF (563 patients). Additionally, Aguilar *et al.* (2019) showed that patients undergoing C2-C3/C3-C4 high level cervical ACDF demonstrated a 32% postoperative risk of dysphagia (i.e. 239 out of 747 patients undergoing 1-level ACDF); they, therefore, recommended performing such high cervical procedures in IF settings.^[2] Nevertheless, they found the following risks factors did not enhance the risk for OSD/ASC high 1-level ACDF surgery; older age, high body mass index (BMI), a smoking history, or longer operative times.^[2] Somewhat overlapping major medical/neurological contraindications to performing ASC cervical surgery were observed by Yemeni *et al.*; these included advanced age, significant medical comorbidities, obesity, and significant/severe myelopathy.^[19]

“SELECTION BIAS” FAVORS YOUNGER/ HEALTHIER PATIENTS FOR OSD/ASC CERVICAL SURGERY

Several studies documented a deliberate patient “selection bias” favoring younger/healthier patients to undergo OSD/ASC versus IF cervical surgery [Table 1].^[11,12,19] In 2019, Khalid *et al.* compared the morbidity data for 2059 patients undergoing 1–2 level ACDF in an ASC versus 26,368 performed in IF; ASC patients had lower 4% postoperative readmission rates versus IF patients who, with diabetes, smoking, and/or higher BMI, had higher 10% readmission rates.^[11] Additionally, IF patients exhibited more major postoperative complications that included; urinary tract infections, heart attack (MI), and phlebitis/pulmonary embolism (PE). In their other 2019 study, Khalid *et al.* compared the 30 day readmission rates for Medicare patients (i.e. over age of 65) undergoing 1–2 level ACDF; 1035 were performed in ASC versus 16,386 performed in IF [Table 1].^[12] The inpatients, with more major comorbidities, exhibited an anticipated higher frequency of postoperative urinary tract infections, surgical site infections, DVT/PE, and heart attacks. However, they did not anticipate that ASC Medicare patients would have higher 10.1% readmission rate versus just 4% for IF patients; this finding was largely attributed to the more

effective/efficient recognition of AE during the prolonged hospitalization of IF patients versus the 23 h stays for ASC patients. When Yemeni (2020) *et al.* performed a metaanalysis of over 21 articles (before April 20018), they found lower reoperation and mortality rates for ACDF performed in OSD/ASC settings [Table 1].^[19] However, this finding was likely attributable to their “selection bias” favoring younger, healthier patients, with fewer comorbidities to undergo OSD/ASC procedures.

COMPARABLE 30-DAY OUTCOMES FOR 1-LEVEL CERVICAL DISC ARTHROPLASTY (CDA) PERFORMED IN ASC VERSUS IF

Segal *et al.* (2019) looked at 30-day outcomes for patients undergoing 1 level CDA performed in ASC versus IF [Table 1].^[17] Using the NSQUIP (National Surgical Quality Improvement Program) database, they found 531 CDA performed in ASC versus 1022 done in IF; there were no clear statistical differences in 30-day readmission, reoperation rates, or complication rates between the two groups. However, they did acknowledge a significant “patient selection bias” for younger/healthier patients to undergo cervical ASC surgery.

0% MORTALITY RATES REPORTED FOR OSD/ASC (4–6–10 H) AND ASC (23 H) CERVICAL SURGERY

6 Clinical series showed 0% mortality rates for OSD/ASC versus 0.1% for IF cervical surgery

In 2007, Fountas *et al.* documented 1 death (0.1%: esophageal perforation) occurring out of 1015 patients undergoing ACDF in an inpatient setting (IF).^[6] Six other clinical series involving cervical surgery performed in OSD/ASC documented 0% mortality rates [Table 1].^[1,7–9,13,14] These latter studies involved a total of 5071 patients, with between 30 and 2000 patients/study; most patients underwent 1–2 level ACDF, with fewer having 3–4 level ACDF, or CDA.

3 Other review articles showed 0% to low mortality rates for OSD/ASC ACDF surgery

Three other review articles found 0% to “low” mortality rates for cervical surgery performed in OSD/ASC versus 0% to higher mortality rates for IF cervical procedures [Table 1].^[3,5,19] Ban *et al.* (2016) found no deaths occurring in 12 studies involving ACDF performed in OSD or IF.^[3] In Epstein’s 2016 review of 13 articles, there were no mortalities reported for cervical procedures performed in OSD/ASC.^[5] In an analysis of 21 articles in 2020, Yemeni *et al.* found “lower mortality rates for OSD/ASC cervical surgery versus higher mortality rates for IF cervical procedures.”^[19]

2 MEDICOLEGAL SUITS PRIOR TO 2018 REVEALED 2 MORTALITIES OCCURRING AFTER ACDF PERFORMED IN OSC

The author performed expert medicolegal reviews in 2 cases (prior to 2018) involving wrongful deaths occurring after patients were discharged from OSD following ACDF. The first case involved a single-level ACDF with a cardiorespiratory arrest occurring within several hours of discharge; the patient sustained a major hypoxic injury, and expired the following day. The second case had a multilevel ACDF with discharge home within just 4 hours of surgery; this patient also sustained a cardiorespiratory arrest at home but remained vegetative on a respirator for a year prior to their demise. Note, that if just one neurosurgical expert could identify 2 such wrongful death suits following cervical surgery performed in OSD/ASC facilities, there are probably many more that have gone unreported.

CONCLUSION

Selection “bias” favors choosing younger/healthier patients to undergo cervical surgery in OSD/ASC facilities results in better outcomes. Alternatively, performing cervical surgery on older patients with more medical comorbidities in inpatient facilities yields anticipated poorer results. Of interest, few to no mortalities were reported in the literature attributed to cervical surgery performed in OSD/ASC facilities. Nevertheless, the author alone was a plaintiffs’ expert in 2 wrongful death suits prior to 2018 attributed to cervical procedures performed in OSD. Therefore, there are likely more such suits in the medicolegal literature, and more mortalities from these OSC/ASC cervical procedures that are going under-unreported.

Declaration of patient consent

Patient’s consent not required as patients identity is not disclosed or compromised.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Epstein N. Perspective on morbidity and mortality of cervical surgery performed in outpatient/same day/ambulatory surgicenters versus inpatient facilities. *Surg Neurol Int* 2021;12:349.